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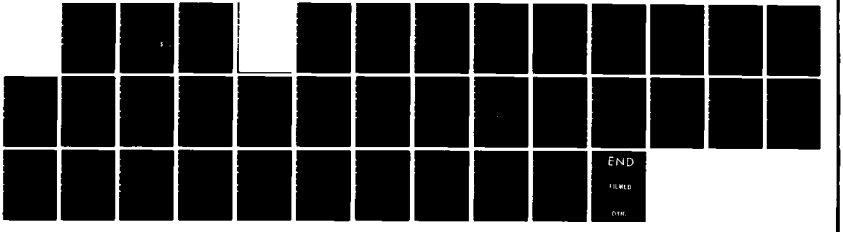

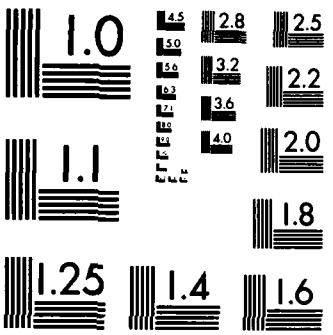

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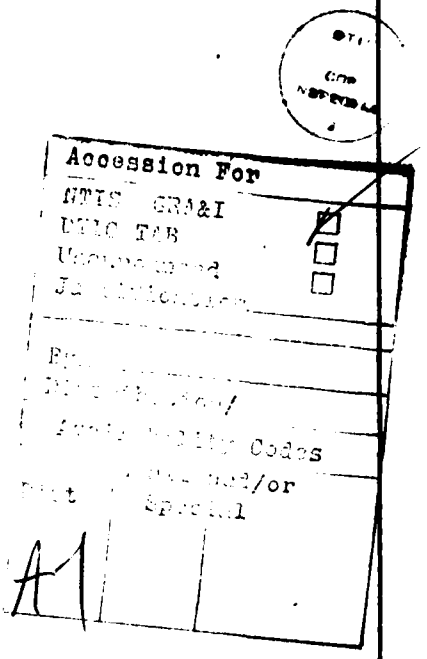

USAWC MILITARY STUDIES PROGRAM PAPER

THE C-17: WE NEED IT YESTERDAY

INDIVIDUAL ESSAY

by

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25 April 1985

ABSTRACT

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This paper revisits the historical development of the C-17, beginning in the 1970's when Tactical Airlift Command was pressing for development of the Advanced Medium Shortfield Takeoff and Landing Transport. An in-depth look is taken at the Congressionally Mandated Mobility Study and at the analyses done by the C-X Task Force that led to the final definition of the C-17. The US Air Force Airlift Master Plan is reviewed to show the importance of the C-17 to the structure of our airlift force of the future. Real world potential applications of the C-17 are projected by examination of two studies of actual airlift operations, AHUAS TARA '83, a combined operation in Honduras, and URGENT FURY, the US rescue mission to Grenada in October 1983. Data for the AHUAS TARA study is from the Report to the Committees on Armed Services of the Senate and House of Representatives, "Validation of the Requirement, Concepts and Design for the C-17 Airlift Aircraft," prepared by the Department of Defense. URGENT FURY data was compiled by the Directorate of Studies and Analysis, Deputy Chief of Staff, Plans, Headquarters, Military Airlift Command. This essay supports the need to buy the C-17 by showing the detailed, logical process that led to its design, and by using two recent actual operations to show the airplane's unprecedented capabilities in the airlift world of today and into the foreseeable future.

This is 1985. In five short years it will be 1990. In 1990, even if everything goes perfectly, the US will still not have a new airlift aircraft on the ramp. The average age of our C-141's will be over twenty years and over one hundred of our C-130's will be over thirty years old. As they get older, aircraft get less dependable and more expensive. Many of the young aircrewmen of today are flying aircraft that are older than they are. It may sound as if we have let our airlift resources suffer from neglect that borders on criminal. We have not.

Over the past ten years a continual effort has carefully and expertly defined the requirement and developed the technology to meet the need. In the seventies it was called the Advanced Medium Shortfield Takeoff and Landing Transport (AMST). That technology was advanced into a new emphasis on strategic mobility that led to the C-X studies. The aerospace industry responded to the requirements defined by the C-X methodology by developing the C-17. The Congressionally Mandated Mobility Study quantified, for the first time, the national mobility objectives that must be met. The USAF Airlift Master Plan blueprints the programming actions that will meet our national airlift needs into the 21st Century. The end result of this exhaustive effort and the cornerstone of the Airlift Master Plan is the McDonnell Douglas C-17A.

Congress directed, in the FY1984 Authorization Conference Report, that the Secretary of Defense submit a report to the Committees on Armed Services of the Senate and House of Representatives, validating the requirement, concepts and design of the C-17. The C-17 Validation Report, dated 6 February 1984, went to the Secretary of Defense, signed by the Secretaries of the Air Force and Army, the Chiefs of Staff of both services, and the

Commandant of the Marine Corps, and was forwarded to Congress. Congressional action will ultimately decide the question.

This paper will revisit the historical development of the C-17, and examine the validity of the need for the aircraft. Two actual airlift operations, AHUAS TARA 83, a combined operation in Honduras, and URGENT FURY, the US rescue mission to Grenada are examined as real world tests of the future utility of the aircraft.

The history of a new airlift aircraft can be traced from the early 1970's when Tactical Air Command recognized the need for a follow-on for the Lockheed C-130 with the added ability to carry outsize cargo. Military Airlift Command (MAC) picked up the program in 1975 when that command became the single DOD manager for airlift. The concept at that time was to field an AMST. Prototypes were produced by Boeing, the YC-14, and by McDonnell-Douglass, the YC-15.[1]

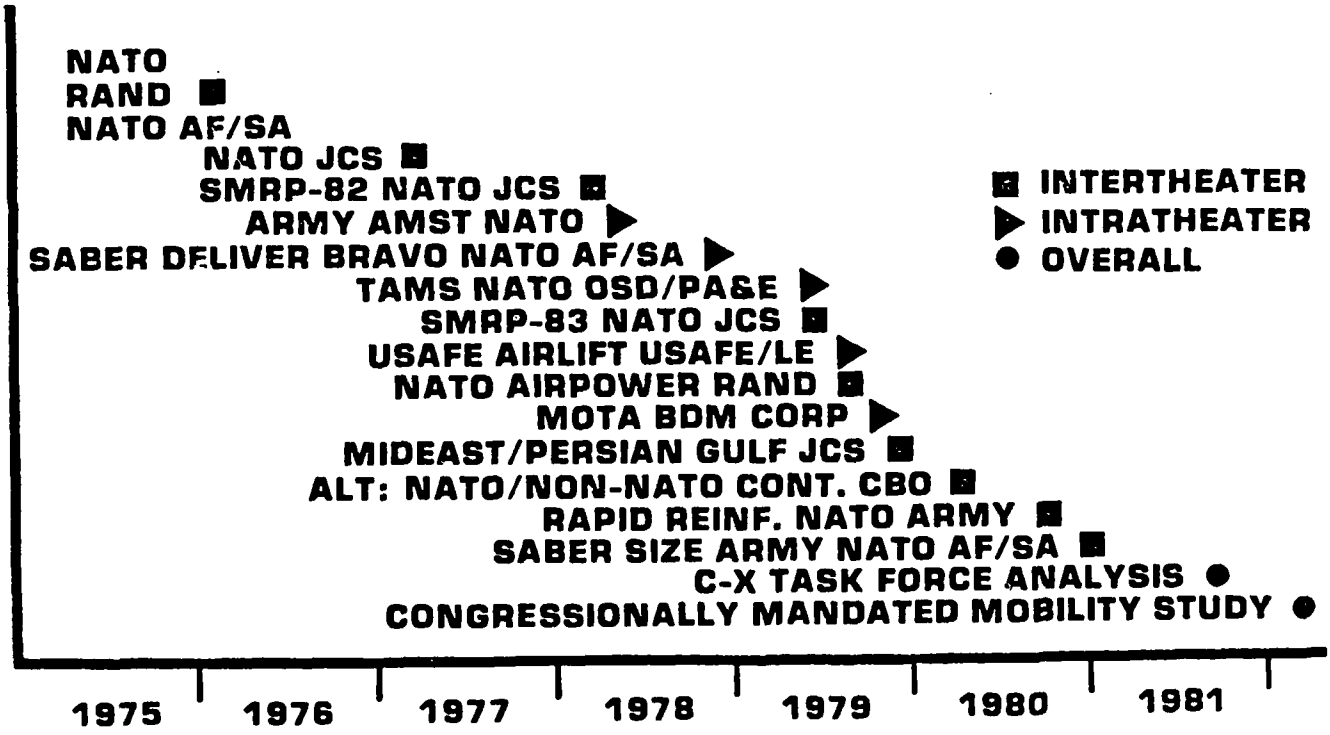
By 1979 Congress recognized the limitations of the AMST, specifically its inability to carry required loads over strategic distances, such as from the US to Europe. Also particular attention was drawn to mobility considerations by the formation of the Rapid Deployment Force. The chaotic world situation in the late 1970's, particularly in the Persian Gulf area, brought the need for mobility to the fore in our national government. It became woefully evident that rapid deployment was greatly limited by significant mobility shortfalls. Consequently in 1979 funding for the AMST program was terminated by Congress and the program was subsequently cancelled by Secretary of Defense Harold Brown. The focus shifted from tactical employment to strategic mobility.

As the US Congress struggled to grasp the magnitude of the overall mobility problem, they directed the Secretary of Defense to conduct a

comprehensive study to determine overall US military mobility requirements. This direction came in the FY1981 Defense Authorization Act, and led to the development of what is now known as the Congressionally Mandated Mobility Study (CMMS).

Mobility studies were certainly not new at that point. In the past ten years various agencies have conducted over 150 mobility assessments. These studies have been performed by the Air Force, Joint Chiefs of Staff, Secretary of Defense, the Congressional Budget Office, and civilian contractors. Regardless of the assumptions or the methodology, the conclusions were consistent in showing a significant shortfall in this country's ability to mobilize and project force. Despite these numerous and detailed studies, the effort was at best piecemeal and without a focus on the overall problem.[2]

MAJOR MOBILITY STUDIES SINCE 1974



The CMMS was a very detailed look at all facets of mobility, conducted by evaluating four scenarios: (1) a Soviet-backed indigenous force attacking Saudi Arabian oil fields, (2) the Soviets invading Iran, (3) a NATO/Warsaw Pact Conflict, and (4) a two-front engagement combining the scenarios in Southwest Asia and NATO. For the first time ever, all aspects of the entire mobility problem were incorporated.

To meet these military challenges, the study recommended more airlift, sealift, and prepositioning, both ashore and afloat. The airlift objective was an additional twenty million ton-miles per day beyond the forty-six million projected level for FY86, for a total of sixty-six million ton-miles per day. At least half of this additional twenty million ton-miles per day was directed to be for outsized cargo such as armored vehicles, self-propelled artillery, large helicopters and other combat support and combat service support vehicles.[3] MAC at that time had several upgrade programs underway that, while they provided significant improvements in strategic mobility, in aggregate fell well short of this goal. These airlift enhancement efforts included the C-141B stretch modification, the Civil Reserve Air Fleet (CRAF) enhancement, and the C-5 wing modification.

It is important to note that strategic shortfalls quantified by the CMMS forced a significant change in the follow-up airlifter development program. The AMST, designed primarily as a tactical enhancement/ replacement was cancelled and replaced with a new strategic effort. From this clear shift in concept was born the development concept for the new aircraft, the C-X.

While the CMMS was in progress, the airlift planners at Headquarters, Military Airlift Command and the Air Staff formed a C-X Task Force at the Pentagon in December 1979. The purpose of the task force was to conduct

analyses, develop an operational concept, determine what capabilities the aircraft should have, and market that solution to the Air Force/Army, OSD, and the Congress.[4] A review of some of the innovative methodology of the task force will show how many of the original C-X concepts are integral to the C-17.

One of the first products of the task force had to be the Preliminary System Operational Concept (PSOC) to describe the intended purpose, employment, deployment and support of the C-X. The PSOC served as the basis for the Request for Proposal, written by Air Force Systems Command, from which prospective bidders could prepare design proposals.[5]

To provide a workable basis for evaluating the C-X requirement, the task force chose to design a set of representative mission scenarios in which the aircraft would have to successfully operate. These scenarios would serve as the basis for design characteristics rather than the more traditional dimensional and performance characteristics normally used in weapons systems definition. The scenarios would also allow evaluation of various proposals against the airlift system as a whole. Properly designed scenarios would determine, to a large extent, what the C-X would be able to do, with the primary focus on the mission itself, not isolated design characteristics or performance parameters. The final PSOC would not prescribe exact speeds, ranges, or payloads, but would accurately describe the mission. In other words, the Air Force would provide a mission to be performed by the aircraft to the bidders. The aircraft companies, as the experts in building the equipment, could then use their design expertise and technology to build an aircraft that would do that job.[6]

The airlift mission analysis that was done was an exhaustive look at all aspects of meeting potential contingencies in the 1985-1990 time frame.

Three major areas, Central Europe, Saudi Arabia, and Korea, and two minor areas, Zaire and Venezuela were studied.[7]

One of the first obvious capabilities that the C-X needed was the ability to carry outsized cargo. As the number of Army heavy divisions increases, so does their weight--by approximately twenty percent. More critical than the pure weight increase is the fact that outsized tonnage is projected to increase by sixty-four percent in the future. While other airlift enhancements such as the C-141 stretch program and the CRAF enhancement would accommodate shortfalls in some classes of cargo, such as bulk or oversized, the C-X must take care of the outsized shortfalls.[8]

Another critical capability identified by the scenarios is that of direct delivery of outsized cargo to the immediate combat area. The C-5, our only outsized airlifter at the present time, can deliver the main battle tanks and other large equipment items only into the larger, rear area airfields. Intratheater airlift of these items is impossible due to limits on the C-130's ability to carry the equipment. The C-X, by delivering directly into the small, austere airfields, would solve this problem. Additionally, though not designed primarily for the mission, the C-X could greatly augment the C-130 in its traditional intratheater role. The factor is four to one.

Aerial refueling capability was another capability that the C-X was demonstrated to need. Besides extending the range of the aircraft, this capability would help greatly in reducing ramp saturation at en route bases and reduce overflight rights problems. In many cases the need for en route support could be eliminated entirely.

Perhaps the greatest amount of study performed by the C-X Task Force was an in-depth look at offload airfields. Previous studies that resulted

in a raw number of ton-miles per day had generally overlooked the arrival arrangements for the airlift flow. If a large military force is to be delivered quickly to some trouble spot, an important limiting factor could be a shortage of suitable airfields.

The suitability of a runway is determined by more than a survey of its length and width. Besides these obvious prerequisites, features such as ramp space, taxiways, obstructions and weight bearing capability often dictate the suitability for various types of airlift aircraft. Even in central Europe, the number of airfields capable of handling a sustained flow of C-141's and C-5's is surprisingly limited. To this limitation can be added the possibility of enemy interdiction of the facilities and the projected beddown of fighter units, etc. Airfield saturation becomes a very real problem. Additionally, in more remote areas of the world such as Africa, South America, or the Middle East, there is a good possibility that a long road or surface march would be necessary to get the troops and equipment into battle after they were airlifted into one of the scarce, large terminals.

Ramp space, a requirement for any large airlift flow, is severely limited in most parts of the world. In the Federal Republic of Germany, for example, there are forty runways that meet the dimension requirements for C-5 operation. Of these, six account for approximately eighty-four percent of the C-5 capable ramp space with Frankfurt alone accounting for approximately forty percent of the total.[9] Any outsized cargo delivered into one of these large aerial ports would then be on its own to move to the battle because our present intratheater airlift assets cannot haul outsized items of equipment.

some forces going directly to Point Salines, while others went into Grantley Adams for later onward movement by C-130's and C-141's to Point Salines.

The overall airlift operation is best analyzed in four phases. The first phase is the initial assault and the three C-5 sorties into Grantley Adams. Second is the inter-theater airlift from Pope AFB into Grantley Adams, performed by C-5's and C-141's. The third phase is the Pope AFB to Point Salines resupply missions. The last phase is the remaining CONUS to theater deployments made by C-5, C-141, and C-130 aircraft. The cargo tons and passengers airlifted by aircraft type, day, and on/offload stations were determined from the military air integrated reporting system (MAIRS) movement flow charts from the airlift control elements at Grantley Adams and Point Salines and other available records sources.

The four phases of the operation, based on the carefully compiled and collated mission and load data, provide a near complete picture of the entire airlift operation. From this data, the potential use of the C-17 can be extrapolated.

During phase one, the initial assault, threee C-5's and twenty-two C-130's deployed 820 troops, 164 tons of cargo, and nine UH-60 helicopters to the theater. The helicopters were delivered to Grantley Adams by the C-5's and then flown to Grenada. The troops and equipment were airdropped or airlanded at Point Salines. The following tables break down the sorties and loads and show how the C-17 could have been used in the initial assault.

Operational restrictions dictated that the initial assault on Point Salines Airfield be performed by C-130 aircraft. The runway that was under construction was to be over nine thousand feet long, but its surface was in various stages of completion. Planners could only count on approximately 4,800 feet of the west end being usable and the condition of even that much was not totally certain. This factor, coupled with the severely restricted ramp space and turnaround points eliminated any consideration of the use of the C-141 or C-5 aircraft for the initial assault. For these reasons, twenty-two C-130 aircraft, five MC-130 Combat Talon and seven adverse weather aerial delivery system (AWADS) aircraft, followed by ten C-130's for airland, were selected for the combined airdrop/airland assault on Point Salines Airfield during the early morning hours of 25 October 1983. All aircraft then recovered at Grantley Adams International, Barbados, to refuel and in many cases, return to Point Salines with supplies.

The Army Rangers who were airdropped into Point Salines were able to secure the area and perform a runway clearing operation that allowed all twenty-two of the C-130's to land and unload equipment. The assault force cleared the runway of a large amount of construction equipment and materials, hand removed or steamrolled steel stabilization rods protruding from the surface, and removed concertina wire and barricades. While this enabled the C-130's to deliver their cargo by airland, C-141 operations could not begin until that afternoon. C-5's were used only into Grantley Adams International, Barbados. It was not until 29 October (day 5) that the parking ramp at Point Salines could handle one C-141 and one C-130 or two C-130's.

On 26 October the replacement of the initial assault force by units of the 82nd Airborne Division began. The 82nd deployed from Pope AFB with

success, this time under combat conditions. Using similar methodology to the AHUAS TARA study, the capabilities of the C-17 can be projected into URGENT FURY and the results examined.[24]

The US military rescue mission to Grenada (URGENT FURY) on 25 October 1983 was a classic application of airlift forces in the projection of US power. The US Government responded to a request from the Organization of Eastern Caribbean States, joined by Jamaica and Barbados, to assist in the restoration of order and democracy in Grenada. The considerable concern for the welfare of approximately one thousand US citizens on the island further legitimatized US military action.

As the statistics from the operation were compiled and studied and the inevitable after action reports prepared, a unique opportunity presented itself. Using actual data from URGENT FURY, the advantages of using the C-17, had it been available, could be examined. Appropriate missions during the actual operation could be converted to C-17 equivalents and an overall assessment made.

Before examining this analysis, however, a brief review of the operational parameters facing URGENT FURY planners and the actual conduct of the operation is necessary.

The concept of operations called for a 1750 nautical mile deployment from Pope AFB, North Carolina, for the bulk of the airlift forces employed in the initial assault. Pope AFB also became the primary onload location for most of the follow-on troops and equipment, although there were other deployments of units and support equipment from other continental US (CONUS) locations directly to the theater of operations. C-130's, C-141's and C-5 aircraft each performed their classic airlift missions.

C-17 mission making one shuttle to a Honduran base and back to Puerto Lempira.

Besides these obvious and very significant savings in the number of missions required, several other militarily significant observations can be made from this AHUAS TARA '83 study.

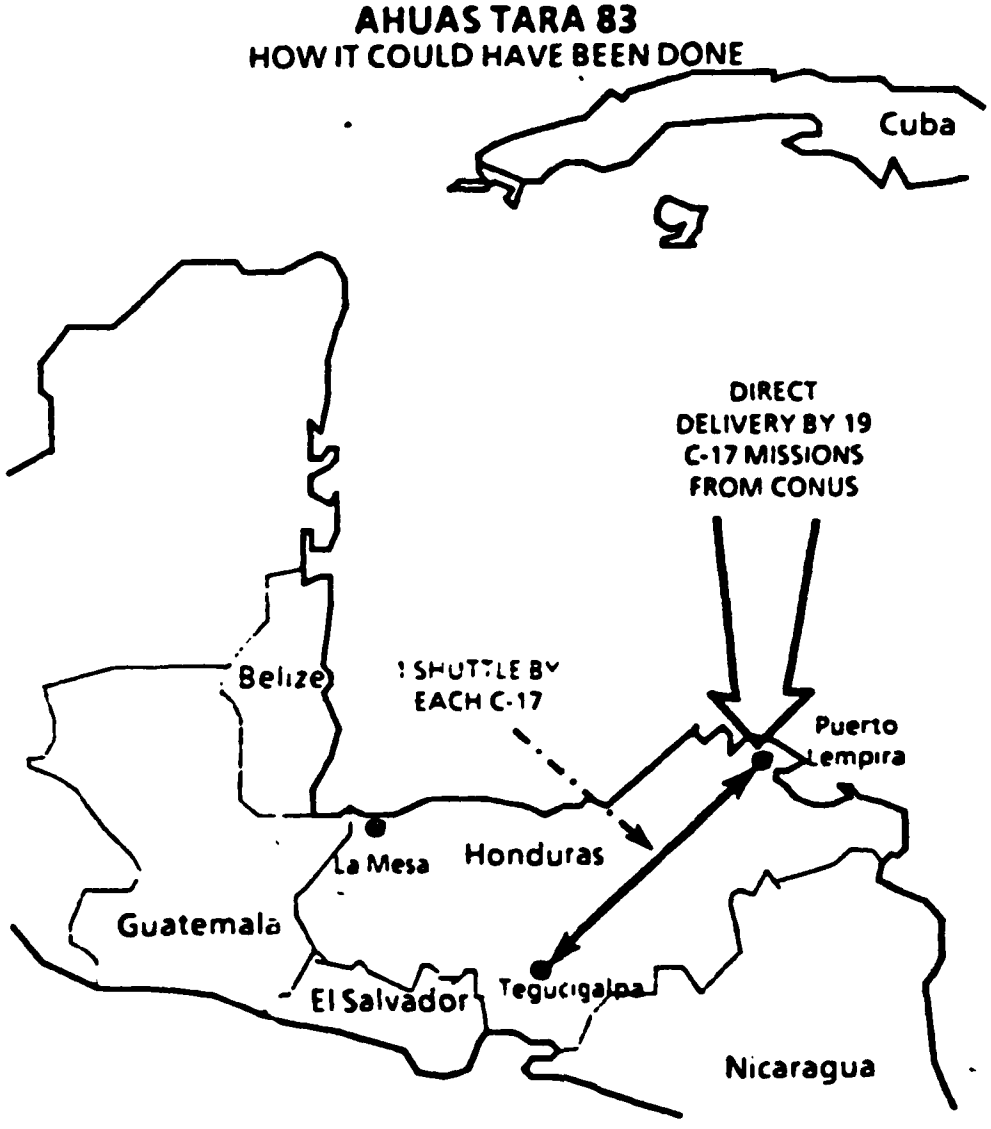
First of all, if a much larger force had been required, the C-17 would have made more efficient use of airlift assets possible. A much more rapid buildup of forces would have resulted from a better matching of aircraft and loads to the available airfields. The lack of a direct delivery capability to Puerto Lempira made for very inefficient use of airlift. If the next contingency requires a maximum effort in airlift, such as conflict in Korea or Europe, this lack of efficiency might be the difference between success and failure.

In the intratheater role, the C-17 would have eliminated the need to beddown the C-130's in theater and eliminated the need for support personnel and equipment at La Mesa and Tegucigalpa. Additionally there would have been no requirement for the en route maintenance and aerial port services at La Mesa since that Main Operating Base (MOB) would not have been needed.

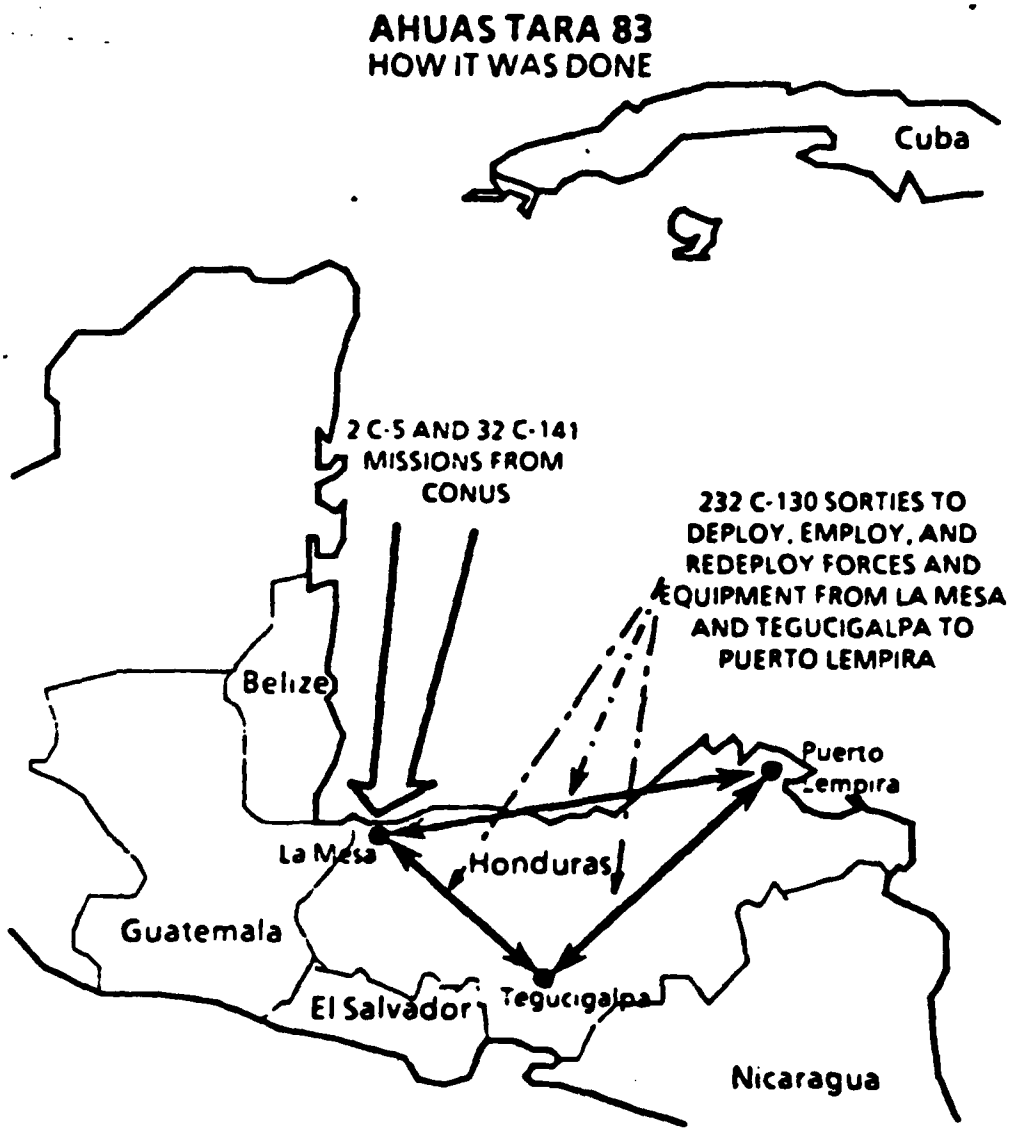
In an actual combat situation, the elimination of the MOB at La Mesa and the sharp reduction in the number of aircraft and personnel that had to beddown in country could be a major advantage. Direct threat to men and machines would be significantly reduced. Also, the ground troops and equipment necessary to protect the additional real estate would be freed up for more direct combat duty.

AHUAS TARA '83 was an airlift success. Eight months later URGENT FURY, the rescue mission to Grenada, was also a spectacular airlift

AHUAS TARA '83 would have been greatly simplified had the C-17 been used. Since the C-17 flights could have all been direct delivery to Puerto Lempira, La Mesa would not have been used at all.



By using only the C-17, the entire intertheater airlift requirement that took two C-5's and thirty-two C-141's could have been satisfied by only nineteen C-17 missions. Each mission from CONUS could have landed directly at Puerto Lempira, thereby eliminating transhipment from La Mesa and the 240 nautical miles ferry flights by the UH-60's. All intratheater requirements, including the airdrop, could have been accomplished by each



The total of all missions, by all three types of airlift aircraft was 266. All types of airlift loads were carried including the outsized helicopters.

Indeed it would be difficult to conceive of any airlift employment more "real" than AHUAS TARA '83 or the even more "real" URGENT FURY.

During AHUAS TARA '83,[23] C-141 and C-5 aircraft delivered their payloads to La Mesa, Honduras, for transshipment by C-130's to Puerto Lempira, 240 nautical miles away. Thirty-two C-141 missions delivered over 819 tons of cargo and 533 passengers to La Mesa. The UH-60 blackhawk helicopters came into La Mesa on two C-5 missions along with 92.1 tons of cargo and 105 passengers. The helo's flew to Puerto Lempira while passengers and cargo from C-5's and 141's went via 160 C-130 sorties.

During the employment phase of AHUAS TARA, the C-130's in their intratheater role, moved over eighteen hundred Honduran troops and 127.5 tons of cargo from Honduran bases to Puerto Lempira. Part of that employment exercise was the airdrop of 347 Honduran troops. Counting positioning and depositioning sorties, the C-130's flew a total of 232 sorties. Pictorially the entire operation is shown here:

generation airlift aircraft. The C-X methodology followed by the C-17 development have provided an attainable aircraft that provides a cost effective satisfaction of that need. Execution of the Air Force Airlift Master Plan into the twenty-first century depends on procurement of this aircraft.

Since the C-17 is not yet on the ramp, actual demonstration of its value to our national mobility capability is not possible. The next best thing is the use of actual exercises and contingencies to test the concepts by comparing how it was to how it could have been with the C-17 available.

The future utility of the C-17 to real world exercises or actual contingencies was dramatically demonstrated by an analysis of the airlift effort involved in AHUAS TARA '83. This exercise, a combined US-Honduran exercise held in January and February 1983 was remarkably similar, in size and type of missions, to the initial assault and the first few days of URGENT FURY, the multi-national rescue mission to Grenada that was to occur only eight months later. The two operations are also very much alike in that a main support base was used to transship passengers and cargo into the employment airfield. Each operation even had a third airfield that required extensive support by intratheater C-130 missions. UH-60 Blackhawk helicopters were delivered by C-5's in both cases to a staging base, from which they flew to their employment location.

The purpose in examining these two major airlift operations is not to analytically compare the two, nor to try to draw any conclusions from their similarity. The basic data from each operation is used as a baseline from which to examine the potential efficiency the C-17 could have offered to each. Both cases provide excellent real world practicality to the study.

availability, and maintainability, all of which exceed the capability of the three present-day airlift aircraft. Failure of the C-17 to meet any of these performance standards will require the contractor to provide corrective action at no cost to the contract.

In addition to these reliability, maintainability and availability standards, warranties also cover specific airframe and landing gear components. The contractor must correct any structural defects that develop during the first forty-five thousand hours of durability testing. Airframe components are warranted for ten years or ten thousand hours and landing gear components for ten years or twenty thousand landings.[21]

The aircraft capabilities mesh well with the needs of the US Army in executing its AirLand Battle of the future. The basic requirements for fighting future battles centers on maneuverability and rapid response, enhanced by the employment of the basic concepts of initiative, depth, agility and synchronization. To exploit enemy weaknesses on the battlefield, Army forces must be highly mobile in order to maneuver and to strike deep. This doctrine emphasizes the need for an increase in intratheater airlift capability, and particularly a need to move outsized firepower vehicles such as the Bradley fighting vehicles, self-propelled artillery, helicopters, and the Sergeant York Division Air Defense weapon.[22]

Outsized capability of present airlift forces is found only in the C-5A fleet which is restricted to the large, permanent airfields. In order to support AirLand Battle doctrine the Air Force must have the required intratheater outsized capability that can only be provided by the C-17.

This review of the past ten years of airlift planning and development shows a quantitative and qualitative validation of the need for a new

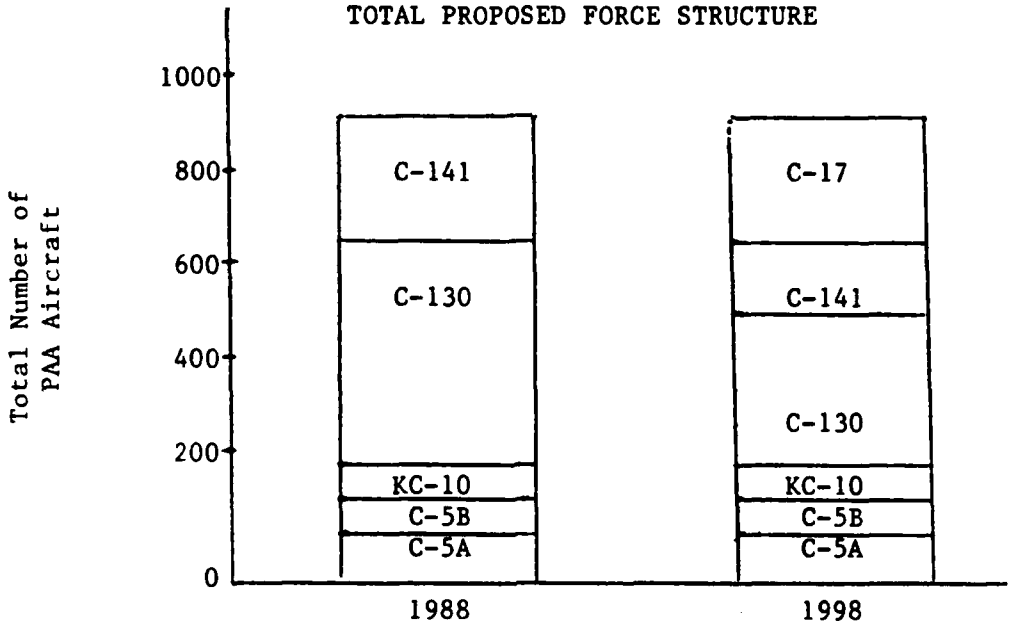
Compared to the proposed two aircraft buy, the C-17 option will show a $17.8 billion savings in operating and support costs (in FY82 dollars) over the programmed thirty-year life cycle.[20]

These impressive monetary savings are only part of the story. The C-17 will be an aircraft born with a silver spoon in its mouth. Its airlifter forefathers have endowed it with a rich inheritance of potential and practicality.

Technology developed and tested during the AMST days is still applicable and available. The C-X methodology that produced the YC-14 and YC-15 provided excellent data, particularly in the area of short field takeoff and landing operation. More specifically, the C-17 short field capabilities have been validated by more than 800 flight test hours on the YC-15 prototype. The Pratt and Whitney PW 2037 engine that will power the C-17 is the most fuel efficient engine available. Fuel efficiency is boosted by a computer controlled, energy performance management system. The PW 2037 engines were certified by the Federal Aviation Agency in December 1983 and will have logged more than six million civil flight hours on the Boeing 757 prior to first use on the C-17. The latest advances in digital computer hardware and software will be incorporated in the avionics of the new aircraft. The systems are similar to those already proven by performance on the DC-9-80, Boeing 757, and Boeing 767 airliners. These and other applications of proven, state-of-the-art components and technology reduce the risk and the cost of the new airlifter. The intent is to produce and maintain a new generation airlifter and stay within projected life cycle costs.

To best insure low support costs and high performance, the C-17 contract contains unique warranty provisions concerning reliability,

The final result will be not only an airlift force capable of meeting the CMMS sixty-six million ton-miles/day, but also one having the important additional advantage of increasing intratheater capability by seventy-eight percent. Graphically, the new arrangement looks like this:[17]



FORCE STRUCTURE FEATURES

*Retires 180 PAA older C-130's.[18]
*Retires 54 PAA C-141B's as they reach the end of their useful life.
*Transfers some C-141B's to the ARF.
*Acquires 180 PAA C-17's.
*Retains 114 PAA C-5's.
*To comply with total force policy objectives, this force structure will contain a force mix of C-5's, C-141's, C-17's, and C-130's in the active Air Force, Air National Guard, and US Air Force Reserves.

A possible alternative to the 210 C-17's buy would be acquisition of additional, new C-5B's and C-130's. The total requirement would be for 156 additional C-5B's and 180 C-130's. This mix of new aircraft already in production would satisfy the requirement for a sixty-six million ton-miles/day capability, but would not provide the necessary intratheater tonnage called for by Congress. This larger fleet of older technology aircraft would be particularly expensive to operate.[19]

C-141B fleet will be over twenty years, and over one hundred of the C-130's will be over thirty years old. The following table shows the entire picture:[14]

AGE OF AIRLIFT AIRCRAFT

	Aircraft Type	Number	Average Age in 1990
Intertheater	C-141B	268	24 years
	C-5A	77	19 years
	C-5B	50	3 years
Intratheater	C-130A	113	33 years
	C-130B	84	30 years
	C-130E	277	25 years
	C-130H	89	12 years

Regardless of what happens, the older C-141's and C-130's will have to be replaced in the 1990's. The plan calls for moving newer C-141's and C-130's to the reserve as the C-17 replaces them in the active force. Unless these replacements occur essentially as programmed, airlift capability will be lost. Major General Sloan Gill, Chief of the Air Force Reserve, said it well before the Senate Armed Forces Committee: "If the C-17 program is delayed, we will find ourselves with over twenty percent of the tactical airlift force aircraft exceeding thirty-four years of age, and no replacement aircraft available."[15]

The plan calls for retirement of 180 older C-130's between 1991 and 1998, along with fifty-four C-141B's. The rest of the C-141B's, 180, are to be transferred to the Air Reserve Forces (ARF). The 114 C-5's will be spread between the active duty and ARF. To make all of this possible a total of 180 Primary Aircraft Authorized (PAA) C-17's (210 total) must be acquired by 1998. Eventually the 180 C-141B's that remain in the ARF will be replaced by the later C-17's.[16]

be able to airdrop troops and equipment as well as employ the low altitude parachute extraction system (LAPES). These capabilities are those required by the Army to insert or supply forces. Additional Air Force and Navy missions such as missile launching, aerospace vehicle recovery, mine laying and resupply at sea were considered and accommodated.[11]

With the CMMS as a quantitative baseline and the CX studies for capabilities definition, Air Force planners started, in the spring of 1983, to tie it all together by documenting force structure needs into the twenty-first century. The plan balances validated requirements, military utility, manpower constraints, operating costs, force stabilization and modernization. Presented to Congress in 1983, the USAF Airlift Master Plan (AMP) has become what General Ryan, CINCMAC, called a "de facto contract . . . a sound framework for our future military airlift force structure."[12]

The AMP, as the name implies, is a complex document covering many corollary issues. First and foremost is the absolute necessity to structure a force to meet the intertheater sixty-six million ton-miles per day requirement of the CMMS. The plan also calls for careful study of the mid- and long-term intratheater lift requirements, another recognized shortfall.[13]

This look to the future that characterizes the AMP encompasses many salient issues in addition to the airlift shortfall. It allows for attrition and aging of the force and plans for modernization and replacement. It prescribes a balanced mix of airlift forces in the active force, the Air National Guard and the Air Force Reserve. It looks closely at fiscal reality. It is truly an understatement to say that the C-17 is the key to the entire plan.

Perhaps the most pressing aspect of future airlift considerations is the age of our present airlift fleet. By 1990 the average age of the

The C-X Task Force's analysis of free world airfields is shown here.

AIRFIELD SUMMARY TABLE

RUNWAY LENGTH X WIDTH	AFRICA	CENTRAL EUROPE	SOUTH AMERICA	MIDDLE EAST	FREE WORLD LESS US
≥5,000 X ≥ 150	201	56	157	144	1,576
≥5,000 X ≥ 90	641	247	535	393	3,488
≥4,000 X ≥ 90	1,059	294	1,182	480	5,640
≥3,000 X ≥ 90	1,902	436	2,837	586	9,887
≥2,000 X ≥ 90	2,702	710	4,855	640	15,165

The study showed an increase by nearly a factor of two in additional airfields available for each thousand feet reduction in runway required. Also, the number of runways greater than ninety feet wide is significantly larger than the number of those greater than one hundred fifty feet wide.

Based on the data provided by this Free World runway study, the C-X Task Force selected three thousand feet as the desired runway length, sixty feet as its width, and stipulated that the aircraft should be able to complete a one hundred eighty-degree turn on a ninety-feet wide paved surface.

A look at Saudi Arabian airfields will best show how this C-X capability could be used. The Saudi Arabian airfield system consists of ninety-nine airfields with hard surface runways. Of these, only nineteen can handle C-5 and C-141 operations. The C-X could operate into almost all of them.[10]

This direct delivery capability could reduce unit closure time in Southwest Asia by between seven and fifteen percent.

To round out the C-X capabilities the Task Force included many traditional tactical airlift operational and support capabilities. The C-X must

CONUS TO POINT SALINES AND GRANTLEY ADAMS
INITIAL ASSAULT
25 OCT 83

How It Was Done

Aircraft	Missions	Cargo (Tons)	Passengers	Remarks
C-5	3	113	254	9 UH-60 Helos to Grantley Adams
MC-130/C-130 (AWADS)	12	31	550	Airdrop/Airland
C-130	10	20	16	Airland at Point Salines

How It Could Have Been Done

Aircraft	Missions	Cargo (Tons)	Passengers	Remarks
C-5	3	113	254	To Grantley Adams
MC-130/C-130 (AWADS)	12	31	550	Airdrop/Airland
C-17	2	20	16	Airland at Point Salines

Due to the unique combat capabilities of the MC-130 Combat Talon and the AWADS equipped C-130 aircraft, they were not replaced in this analysis by the C-17. Had an all airland operation or a differently conceived airdrop been planned, this could have been done. In the airland portion of the assault as it actually happened, two C-17's could have performed the same airland missions as the ten C-130's that were used.

Phase two of this analysis is of the C-5 and C-141 missions from Pope AFB to Grantley Adams.

POPE AFB TO GRANTLEY ADAMS
25 OCT-22 NOV 83

How It Was Done

Aircraft	Missions	Cargo (Tons)	Passengers	Remarks
C-5	21	712	695	Not including 3 pre-assault missions
C-141	87	1,240	3,698	

How It Could Have Been Done

Aircraft	Missions	Cargo (Tons)	Passengers
C-5	21	712	695
C-17	22	1,240	1,188
C-141	17	0	2,510

C-5 operation was not used into Point Salines due to airfield, ramp and runway obstacle restrictions plus the extremely congested aircraft environment. Most of the equipment and many of the passengers delivered by the C-141's to Grantley Adams could have been directly delivered to Point Salines by the C-17 because the C-17 is designed for efficient ground operations at small austere airfields. The ground maneuverability designed into the C-17 makes it far superior to the C-141 in situations such as those at Point Salines. For example, the C-17 could back up if necessary--the C-141 cannot. The C-141 is better suited to the passenger role, so those missions were retained.

The Pope AFB to Point Salines missions are analyzed as the third phase. Optimizing aircraft capabilities again dictates that the C-141 retain a portion of the pure passenger missions.

POPE AFB TO POINT SALINES DEPLOYMENT
25 OCT-22 NOV 83

How It Was Done

Aircraft	Missions	Cargo (Tons)	Passengers
C-141	195	3,110	6,052

How It Could Have Been Done

Aircraft	Missions	Cargo (Tons)	Passengers
C-17	56	3,110	3,024
C-141	20	0	3,028

The final phase is the CONUS to theater deployments. The missions considered are from CONUS onload stations not already covered and are to all theater offload stations. The C-130 missions include Pope AFB while the C-5 and C-141 missions do not. This is because most of these C-130's are home based at Pope and have not been counted in other phases of the analysis. While all of these missions could have been replaced by C-17 missions, they would not have been, in order to optimize the capabilities of each aircraft. Many of the C-141 and C-130 missions were small cargo and/or passenger missions that were very time sensitive, but not airlift efficient. In many cases, some cargo was dropped off in theater from an aircraft load bound elsewhere. For this and other reasons the load data for many of the 119 C-141 missions are incomplete. Good judgment says to leave these as C-141 missions, not suitable for productive C-17 substitutions.

ALL OTHER CONUS (MINUS POPE AFB) TO THEATER DEPLOYMENT
23 OCT-22 NOV 83

How It Was Done

Aircraft	Missions	Cargo (Tons)	Passengers	Remarks
C-5	7	34	17	
C-141	119*	605	1,577	
C-130	79	328	200	Includes Pope AFB

How It Could Have Been Done

Aircraft	Missions	Cargo (Tons)	Passengers
C-5	7	34	17
C-17	7	381	173
C-141	105	321	1,430
C-130	68	231	174

*NOTE: At time of analysis, load data incomplete for many missions.

The intratheater missions, those going between and among Grantley Adams, Point Salines, and Pearls Airfield (the only other airstrip on Grenada) deserve mention. While the C-17 could have certainly been used in this part of the operation, it is practically impossible to quantify its probable contribution for several reasons. First of all, complete load and mission data is not available due to the fluid and urgent nature of much of the airlift support rendered in the intratheater flying. For example, an urgent medical evacuation mission out of Point Salines to Grantley Adams was handled by whichever aircraft was best in position to fly it. Additionally, many flights were essential, time-sensitive missions carrying small cargo and small passenger loads. While it is certain that a mixture of C-17's and C-130's could have been optimized in the intratheater role, it is not possible to reasonably delineate the optimum mix.

Taking the results of the four phases of this analysis together gives the total picture of the URGENT FURY airlift employment.

TOTAL CONUS TO THEATER DEPLOYMENT
23 OCT-22 NOV 83

How It Was Done

Aircraft	Missions	Cargo (Tons)	Passengers	Remarks
C-5	31	859	966	
C-141	401	4,955	11,327	
C-130	101	379	766	Includes Assault
Total	533	6,193	13,059	

How It Could Have Been Done

Aircraft	Missions	Cargo (Tons)	Passengers	Remarks
C-5	31	859	966	
C-17	87	4,751	4,401	
C-141	142	321	6,968	
C-130	80	262	724	Includes Assault
Total	340	6,193	13,059	

The raw numbers say that 193 fewer deployment missions would have been required if the C-17 had been available for use. Additionally the C-17 would have been able to direct deliver much cargo to Point Salines rather than to Grantley Adams as the C-141's often had to do. Enormous savings in cargo handling effort, intratheater sorties and ramp space would have been the result. Perhaps most importantly, the delivery time of the personnel and cargo would have been greatly shortened by delivery of the troops and supplies directly to the combat area.

While this analysis shows a savings of 193 deployment missions had the C-17 been available for actual URGENT FURY missions, it is nothing more than essentially a mathematical manipulation of load and sortie data. The data shows that the C-17 would have made a significant contribution to the efficiency of the airlift effort. Had the situation been only slightly different in one or more of several ways, the story could have been entirely different.

The first variable to examine is range. The C-130 aircraft that flew the initial assault on Point Salines were extremely low on fuel by the time they reached Barbados. This was despite the fact that they all left their CONUS onload points carrying all the fuel that they could hold. Some of the aircraft took off as much as 12,000 pounds over the normal maximum gross weight. Had the target area for the assault not been Grenada, but some other objective a few hundred miles further away, the plan that proved so successful would not have been possible.

It is not at all difficult to picture a situation very similar to that of URGENT FURY, but just out of C-130 range and having only a short runway available. While the MC-130's can air refuel, the C-130's cannot. If the C-130's had been forced to cycle through some intermediate base for fuel, the chances of achieving surprise would have greatly decreased. Airdropping the troops from C-141's might be possible, but not very wise without a usable airfield somewhere close by to use for air evacuation of wounded, resupply, and perhaps extricating the forces if they are unable to win the battle.

With the C-17 available, we would have the ability to execute the mission. Planners could count on the air refueling ability of the C-17 to get the troops to the objective. Equally important would be its ability to land on small, austere airfields and ground maneuver effectively. It is entirely possible that in another contingency similar to the Grenada rescue, the C-17 might make the difference between being able to accomplish our national objectives and having to stay home.

Besides the favorable range in URGENT FURY, another saving grace was the availability of Grantley Adams International in Barbados, just a short hop from the battle, for use as the deployment operating base (DOB).

Without the friendly and supportive people of Barbados, the large ramp space, sufficient quarters, and the sufficiency of jet fuel, support of the combat operation on Grenada would have been considerably more complicated. Fortunately the C-5's could land in Barbados to unload the helicopters so essential to the battle. If the next conflict of this type has no similar recovery and support base, the C-130's may not be able to perform the assault because the delivery of outsized combat equipment would not be possible. Also the transshipment of large amounts of supplies and thousands of troops could not occur. With the C-17, however, much of this requirement for a close-in support base goes away because of the direct delivery capability and the air refueled range.

There are other "what if's" that could be examined concerning URGENT FURY and in projected scenarios of possible future operations of similar nature. It is clearly evident that had the circumstances of URGENT FURY changed only slightly in any one of several ways the operation would have either become impossible to accomplish, or perhaps would have failed if attempted. As we revel in the success of the airlift effort during URGENT FURY we don't invest much thought in what might have been or what the challenges might be in the next such contingency. The C-17, with its ability to air refuel, direct deliver outsized cargo into short fields, and ground maneuver in an austere environment will provide a much needed capability.

Looking back at the whole C-17 question, it would be hard to conceive a more logical, defendable, or realistic process than the process that has led to this point in C-17 development. Casper Weinberger, Defense Secretary, has recently approved full-scale engineering development of the

aircraft. The critical decision on whether to start building the aircraft is expected by 1987. We need it.

ENDNOTES

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3. Thomas D. Pilsch, COL, USAF. "The Airlift Master Plan: Evolution and Implementation." Defense Management Journal, Fourth Quarter 1984, p. 25.

4. Vincent C. Hughes. "The Airlift Enigma and a Plan for the Future." Armed Forces Journal, October 1982, p. 26.

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7. Pilsch, "The C-X Requirement: Perspective on Airlift." p. 10.

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9. Department of Defense, Validation of the Requirement, Concepts and Design for the C-17 Airlift Aircraft, Report to the Committees on Armed Services of the Senate and House of Representatives, p. 6.

10. Department of Defense, p. 6.

11. Pilsch, "The C-X Requirement: Perspective on Airlift." p. 14.

12. Michael E. Pevini, MAJ, USAF. "Airlift for Near and Far." Air Force Magazine, Octobe 1984, p. 46.

13. The Defense Guidance covering the five-year period to FY89 instructs the Air Force to increase intratheater lift by fifty percent. Presently the aim is for about 16,000 ton-miles per day. This requirement will probably be more exactly spelled out in the Worldwide Intratheater Mobility Study, presently underway.

14. Department of Defense, p. 8.

15. Jasper Welch, MG, USAF Ret. "Strategic Mobility: A Tale of Four SECDEFs." Armed Forces Journal, July 1984, p. 86.

16. Edgar Ulsamer. "The Airlift Master Plan." Air Force Magazine, May 1984, p. 59.

17. Department of Defense, p. 17.

18. Primary Aircraft Authorized (PAA) is the number of aircraft used to compute force structure capability and is based on the total available at any time to support the mission. The others are for training and attrition.

19. Pilsch, "The Airlift Master Plan: Evolution and Implementation." p. 29.

20. Department of Defense, p. 13.

21. Department of Defense, p. 14.

22. Department of Defense, p. 8.

23. Department of Defense, pp. 19-22. All AHUAS TARA '83 data is from this validation report to Congress.

24. HQ, Military Airlift Command, URGENT FURY Airlift Summary and Analysis of Potential Benefits with the Employment of the C-17, March 1984. All URGENT FURY data is from this study.

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